Electrical and Electronics Engineers

Table of Contents *(scroll or use links below to navigate document)*

View Career Video

What They Do

From the global positioning system that can continuously provide the location of a vehicle to giant electric power generators, Electrical and Electronics Engineers are responsible for a wide range of technologies. Electrical and Electronics Engineers design, develop, test, and supervise the manufacture of electrical and electronic equipment. Electrical Engineers specialize in the production, transmission, and uses of electrical power. Electronics Engineers are more involved with low power applications including radio, television, computers and telephones.

Most of California's Electrical and Electronics Engineers are employed in manufacturing industries such as electronic instruments, semiconductor components, motion picture and video production, and architectural and engineering services. Many work for federal, state, and local governments. Engineers in manufacturing and government may be researchers and investigate issues related to possible applications, such as chemical interactions and new materials. Engineers who actually do product design and development use CAD/CAE (computer-aided design and computer-aided engineering) tools to draw up plans for efficient production. The Production Engineers are the "hands on" engineers. They guide products through all stages of the manufacturing process. They also determine performance standards for new products and write maintenance schedules to ensure that these standards will be met. Many engineers also write technical manuals, instructional pamphlets, and installation instructions.

Electrical and Electronics Engineers work in other fields including power plant construction and design, nuclear research, field service and teaching. Engineers are also employed by consulting firms, public utilities, and government. Other engineers skilled in the marketing and sales of technical products are in demand as Sales Engineers.

Tasks

Electrical Engineers

- Confer with engineers, customers, and others to discuss existing or potential engineering projects and products.
- Design, implement, maintain, and improve electrical instruments, equipment, facilities, components, products, and systems for commercial, industrial, and domestic purposes.
- Operate computer-assisted engineering and design software and equipment to perform engineering tasks.

EDD Employment Development Department State of California
LMID Labor Market Information Division "Your Information Source"

Electrical and Electronics Engineers

- Direct and coordinate manufacturing, construction, installation, maintenance, support, documentation, and testing activities to ensure compliance with specifications, codes, and customer requirements.
- Perform detailed calculations to compute and establish manufacturing, construction, and installation standards and specifications.
- Inspect completed installations and observe operations, to ensure conformance to design and equipment specifications and compliance with operational and safety standards.
- Plan and implement research methodology and procedures to apply principles of electrical theory to engineering projects.
- Prepare specifications for purchase of materials and equipment.

Electronics Engineers (except Computer)

- Analyze system requirements, capacity, cost, and customer needs to determine feasibility of project and develop system plan.
- Confer with engineers, customers, vendors, and others to discuss existing and potential engineering projects or products.
- Design electronic components and software, products and systems for commercial, industrial, medical, military, and scientific applications.
- Plan and implement research, methodology, and procedures to apply principles of electronic theory to engineering projects.
- Prepare engineering sketches and specifications for construction, relocation, and installation of equipment, facilities, products, and systems.
- Develop and perform operational, maintenance, and testing procedures for electronic products, components, equipment, and systems.
- Direct and coordinate activities concerned with manufacture, construction, installation, maintenance, operation, and modification of electronic equipment, products, and systems.
- Evaluate operational systems, prototypes and proposals and recommend repair or design modifications based on factors such as environment, service, cost, and system capabilities.
- Inspect electronic equipment, instruments, products, and systems to ensure conformance to specifications, safety standards, and applicable codes and regulations.
- Plan and develop applications and modifications for electronic properties used in components, products, and systems, to improve technical performance.

*Detailed descriptions of these occupations may be found in the Occupational Information Network (O*NET) at online.onetcenter.org.*

Important Skills, Knowledge, and Abilities

- Active Listening — Giving full attention to what other people are saying, taking time to understand the points being made, asking questions as appropriate, and not interrupting at inappropriate times.
- Judgment and Decision Making — Considering the relative costs and benefits of potential actions to choose the most appropriate one.
- Mathematics — Using mathematics to solve problems.
- Science — Using scientific rules and methods to solve problems.

Electrical and Electronics Engineers

- Troubleshooting — Determining causes of operating errors and deciding what to do about it.
- Critical Thinking — Using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions or approaches to problems.
- Reading Comprehension — Understanding written sentences and paragraphs in work-related documents.
- Technology Design — Generating or adapting equipment and technology to serve user needs.
- Engineering and Technology — Knowledge of the practical application of engineering science and technology. This includes applying principles, techniques, procedures, and equipment to the design and production of various goods and services.
- Computers and Electronics — Knowledge of circuit boards, processors, chips, electronic equipment, and computer hardware and software, including applications and programming.
- Mathematics — Knowledge of arithmetic, algebra, geometry, calculus, statistics, and their applications.
- Design — Knowledge of design techniques, tools, and principles involved in production of precision technical plans, blueprints, drawings, and models.
- Near Vision — The ability to see details at close range (within a few feet of the observer).
- Problem Sensitivity — The ability to tell when something is wrong or is likely to go wrong. It does not involve solving the problem, only recognizing there is a problem.
- Oral Expression — The ability to communicate information and ideas in speaking so others will understand.
- Information Ordering — The ability to arrange things or actions in a certain order or pattern according to a specific rule or set of rules (e.g., patterns of numbers, letters, words, pictures, mathematical operations).
- Science — Using scientific rules and methods to solve problems.

Work Environment

Electrical and Electronics Engineers generally work in well-equipped offices and laboratories. Some positions require more active or outdoor work, such as directing operations in manufacturing plants or at construction sites, while some require sitting at a desk most of the day.

Technological advances have created the need for most engineers to work as part of a team, requiring the development of interpersonal as well as technical skills. The intensely competitive nature of high technology manufacturers can cause emotional strain, as each company pushes to develop and introduce new products faster and more cheaply than its competitors.

Most Electrical and Electronics Engineers work a standard 40-hour week; however, overtime and weekend work is sometimes necessary. Many engineers are members of the Institute for Electrical and Electronics Engineers or other professional organizations.

Employment Development Department
State of California
LMID
Labor Market Information Division
"Your Information Source"

Electrical and Electronics Engineers

California's Job Outlook and Wages

The California Outlook and Wage table below represents the occupations across all industries.

Standard Occupational Classification	Estimated Number of Workers 2004	Estimated Number of Workers 2014	Average Annual Openings	2006 Wage Range (per hour)
Electrical Engineers				
17-2071	21,200	24,700	770	$31.41 to $50.42
Electronics Engineers (except Computer)				
17-2072	27,700	32,500	1,030	$34.32 to $53.55

Wages do not reflect self-employment.
***Average annual openings** include new jobs plus net replacements.*
Source: www.labormarketinfo.edd.ca.gov, Employment Projections by Occupation and OES Employment & Wages by Occupation, Labor Market Information Division, Employment Development Department.

Trends

The projected job growth for Electrical and Electronics Engineers is at an average rate for all occupations. A need for more Electrical Engineers is expected in the motion picture and video industry, while opportunities for Electronics Engineers are expected in computer systems design, electronic instrument manufacturing, electronic components, and federal government. However, most hiring activity expected between 2004 and 2014 will be to replace workers who have left for retirement or other types of work.

Training/Requirements/Apprenticeships

A bachelor of science degree in Electrical or Electronics Engineering is essential to secure an entry-level position. Engineers frequently go on to graduate school after obtaining their four-year degree. Research or faculty positions usually require a masters or doctoral degree. Graduate degrees are also sometimes required for promotions. Electrical and Electronics Engineers must continue to study throughout their career to keep up with the latest technologies.

Electrical and Electronics Engineers must be licensed by the California Board for Professional Engineers and Land Surveyors.

Recommended High School Course Work

Colleges and universities are usually very specific in their entrance requirements. Required high school courses usually include calculus, algebra, geometry, trigonometry, physics, and chemistry. Computer classes are also highly recommended. Engineers must have an aptitude for science and mathematics, as well as an analytical mind and the ability to do detailed work.

Where Do I Find the Job?

Firms employing Electrical and Electronics Engineers frequently recruit for entry level positions on college campuses in both the fall and spring. Advertisements of open positions appear in professional journals, trade magazines, and newspapers. Employers and applicants use the employment services of professional societies, private employment agencies, and the Employment Development Department.

Electrical and Electronics Engineers

Direct application to employers remains one of the most effective job search methods.

Use the *Search for Employers by Industry* feature on the *Career Center* page at www.labormarketinfo.edd.ca.gov to locate employers in your area. Search using keywords from the following manufacturing industry names to get a list of private firms and their addresses:

- Architectural Services
- Bare Printed Circuit Board
- Electricity & Signal Testing Instruments
- Electromedical Apparatus
- Electronic Computer
- Engineering Services
- Industrial Process Variable Instruments
- Landscape Architectural Services
- Motion Picture and Video Production
- Other Electronic Component
- Other Measuring and Controlling Devices
- Search, Detection, & Navigation Instrumnt
- Semiconductor and Related Devices
- Testing Laboratories

Search these **yellow page** headings for listings of private firms:

- Engineers

Search the **white pages** under *Government Listings*:

- Government, State or Local

Where Can the Job Lead?

Advancement opportunities exist along a structured career path for both the Electrical and Electronics Engineers. They can advance to a Senior Engineer and to a Supervising Engineer. In some cases they may be able to advance to managerial positions.

Lateral movement to other occupations is quite easy with a college degree in electrical or electronic engineering. Many companies across many industries welcome employees with an educational background in Electrical and Electronic Engineering.

Other Sources of Information

Institute of Electrical and Electronics Engineers
www.ieee.org

California Board for Professional Engineers and Land Surveyors
www.dca.ca.gov/pels

Employment Development Department
State of California
LMID
Labor Market Information Division
"Your Information Source"